

A stack of white papers with blue lines, slightly blurred, set against a light blue background.A blurred, circular clock face with numbers, set against a pink and purple background.

Ishikawa fishbone diagram

A stack of white papers with blue lines, slightly blurred, set against a light green background.A yellow analog clock with black numbers and hands, set against a yellow and orange background.

Skorkovský ESF MU KPH

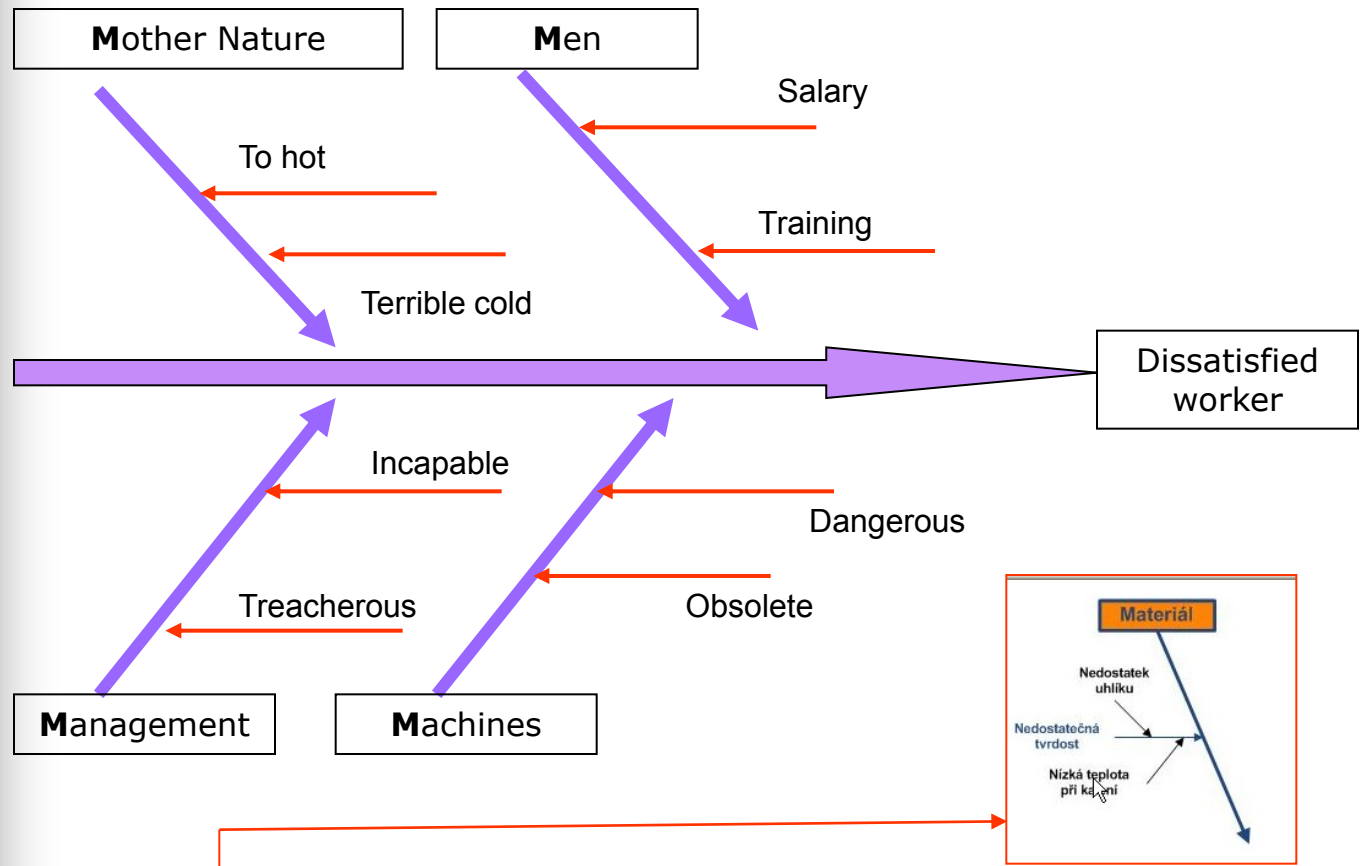
Introduction (FBD= fishbone diagram)

- FBD is a tool to find out relationships:

Cause → Effect

- Use in QM especially in automotive industry
- One of the tool set used to create so called 8D report (8 disciplines=FBD+5WHYs+PA+QM)
- Another tool : 5 WHYs - will be cleared later
- Another tool : PARETO=PA analysis will be shown later

Fishbone diagram



(Methods, **Material**, Manpower, Measurement, Machines, Mother Nature, Management)

Some chosen problems which could be find out during ERP support process I

- long response time to requirements
 - requirement is directed to unsuitable consultant
 - bad documentation about service action (poor log)
 - people ask repeatedly same questions at different moments and different consultants are asked
 - solution of disputes :complaint- standard service
 - payment asked for supplied services
1. how much (to whom, type of task, type of the error- see diagram
 2. starting time for invoiced services, response time
 1. requirement is handed over till the problem is solved
 2. time of starting solving -solved
 3. start of implementaion of the bad object till end of testing
 4. training

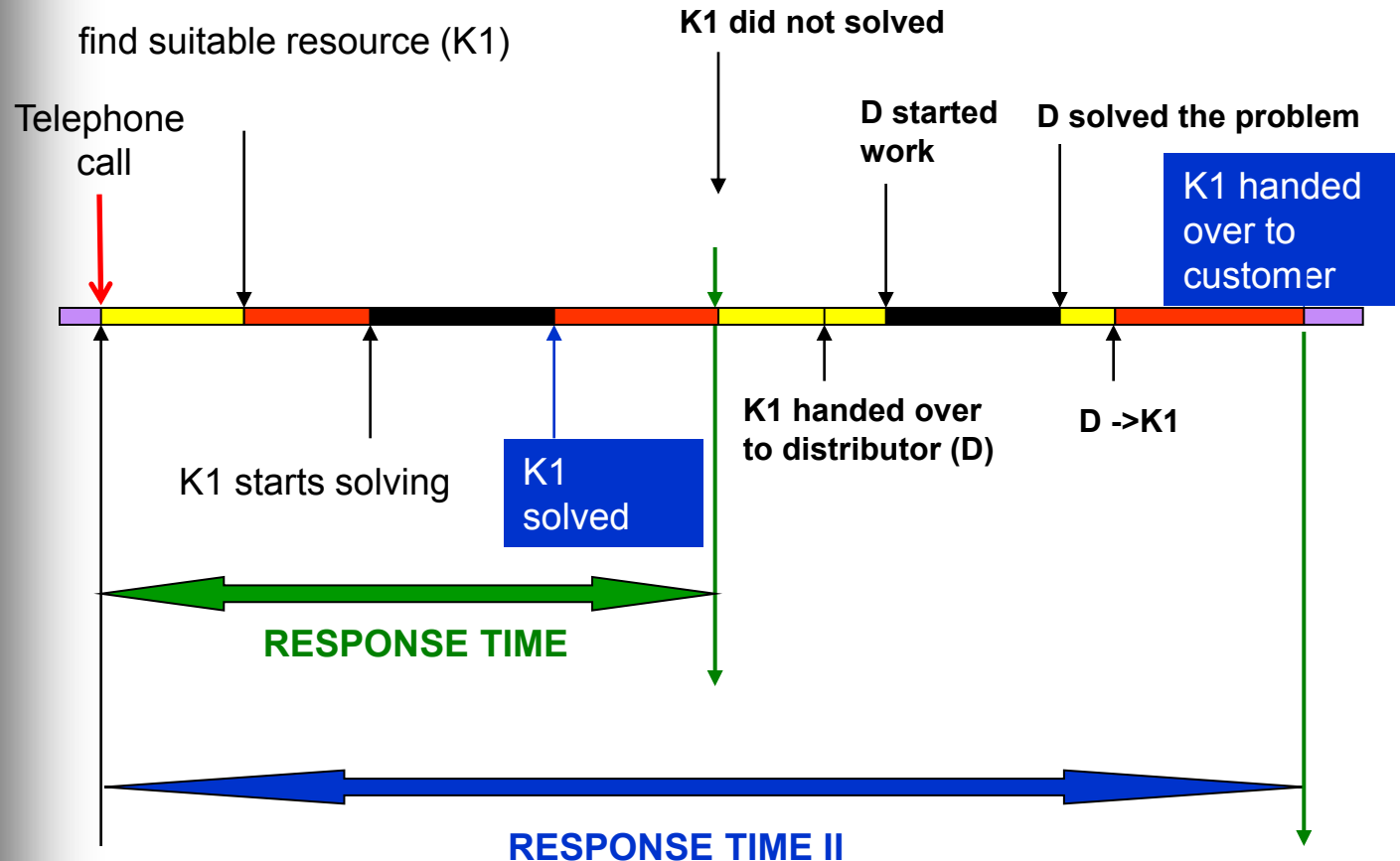


Some chosen problems which could be find out during ERP support process II

- bad training methodology
- bad consultants
- bad communication protocol
 1. telephone
 2. e-mail
 3. SKYPE
- lack of interest of the management of both parties
- right specification of reaction time
- specification to the error types and related response times
- response time of the distributor (ERP integrator ERP)



Diagram – response time



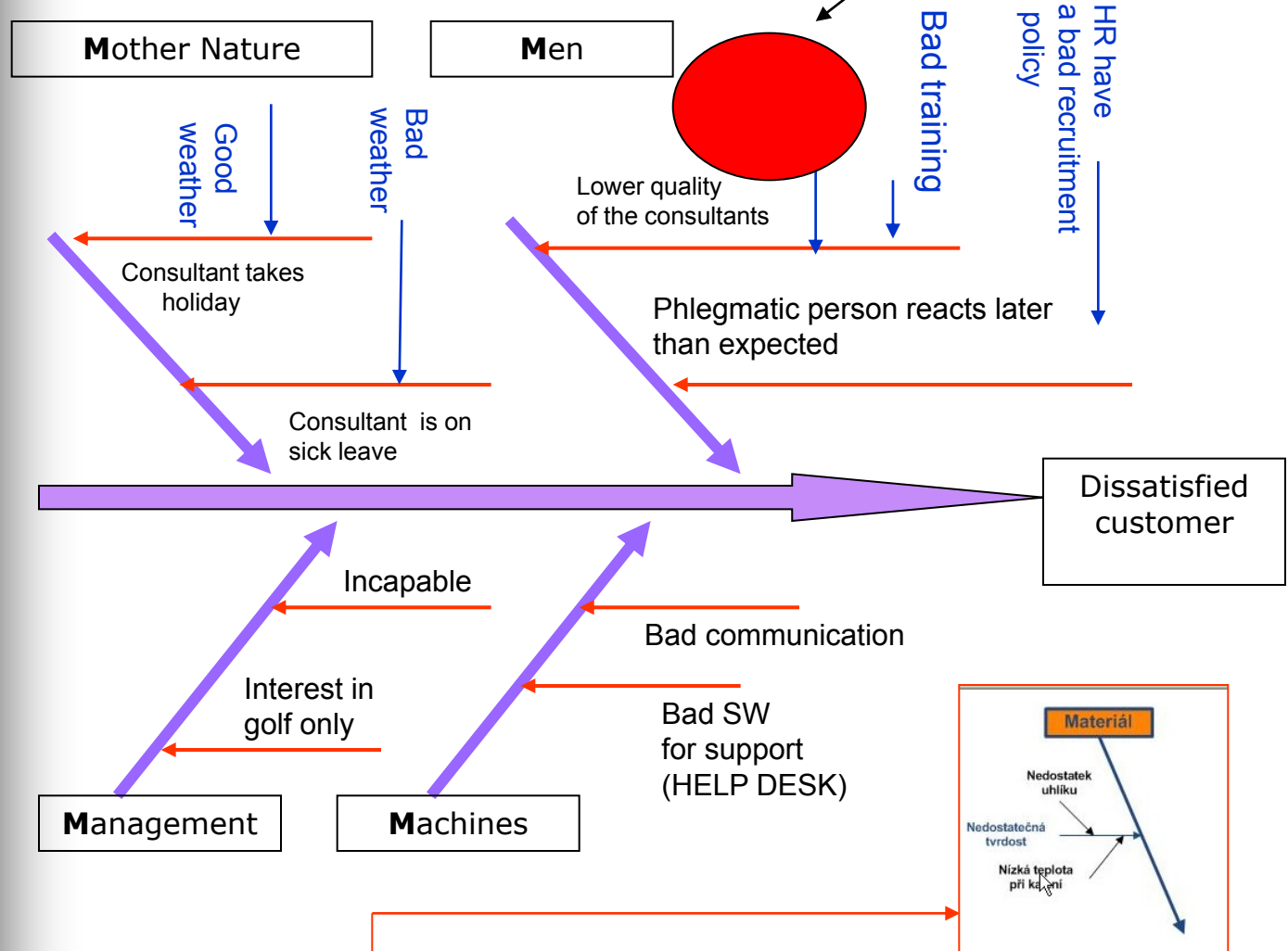
handed over requirement

— = active work

— = idle time

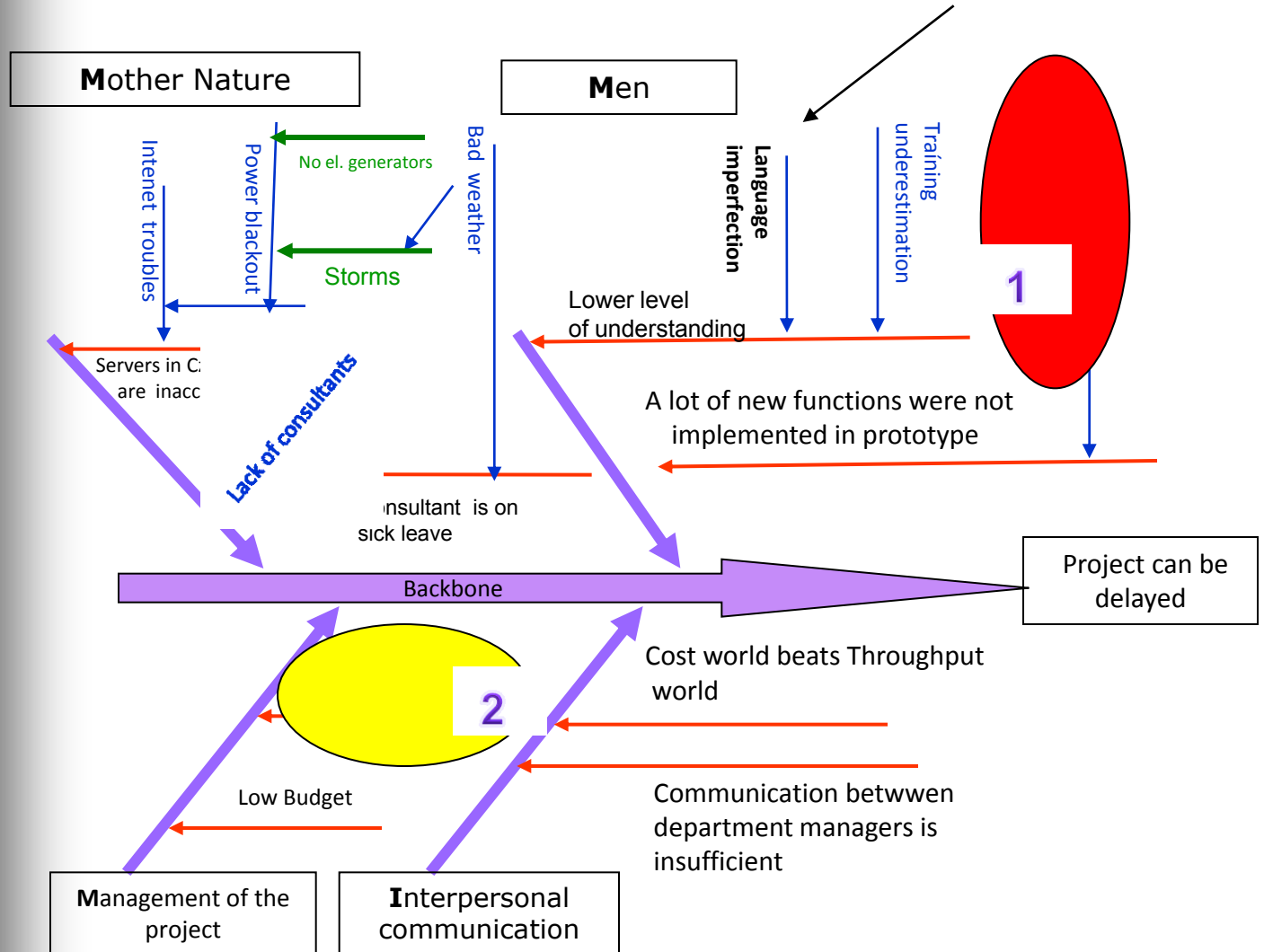
Fishbone diagram-support

heart of the problem



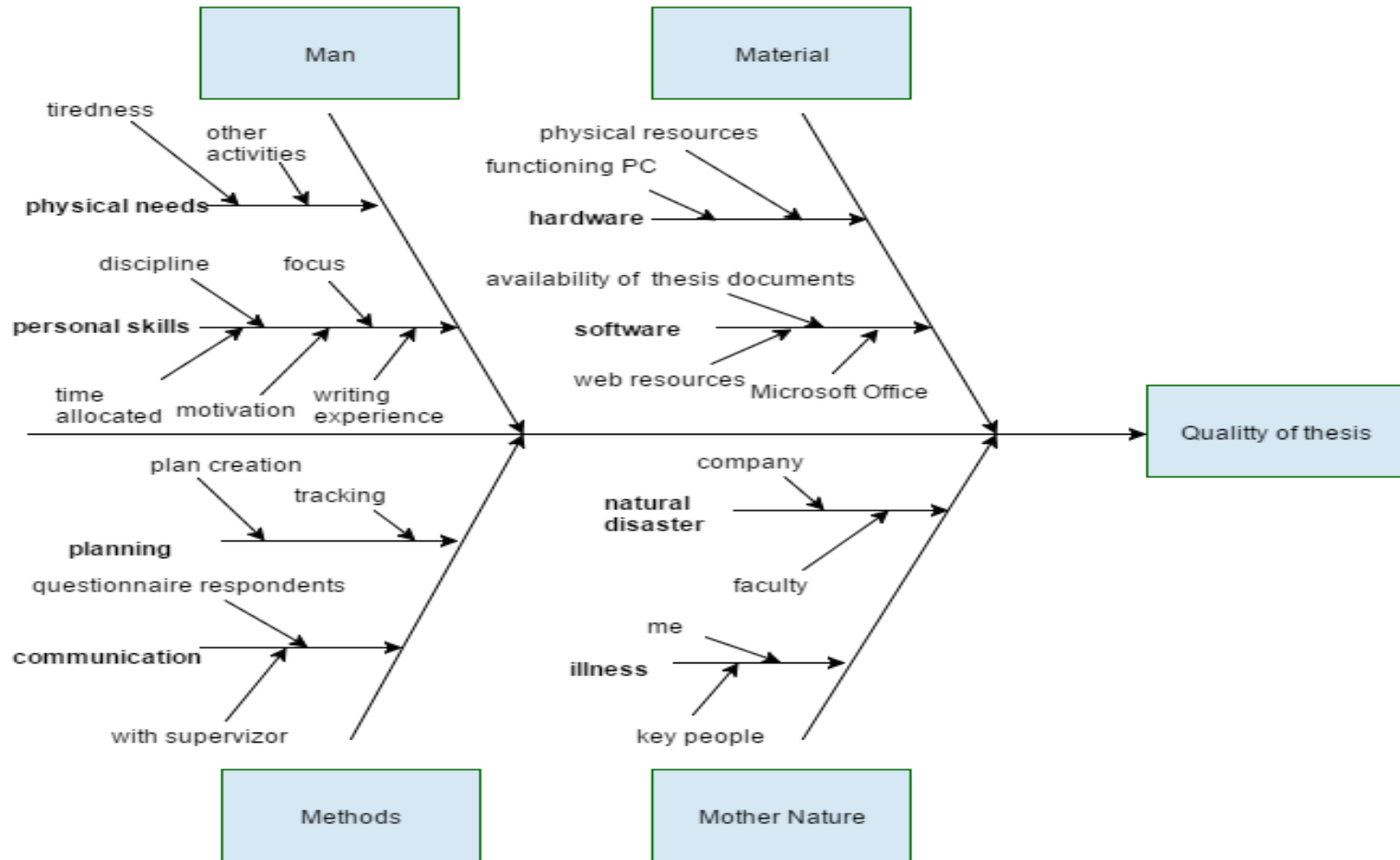
(Methods, **Material**, Manpower, Measurement, Machines)

Fishbone diagram-SA Project



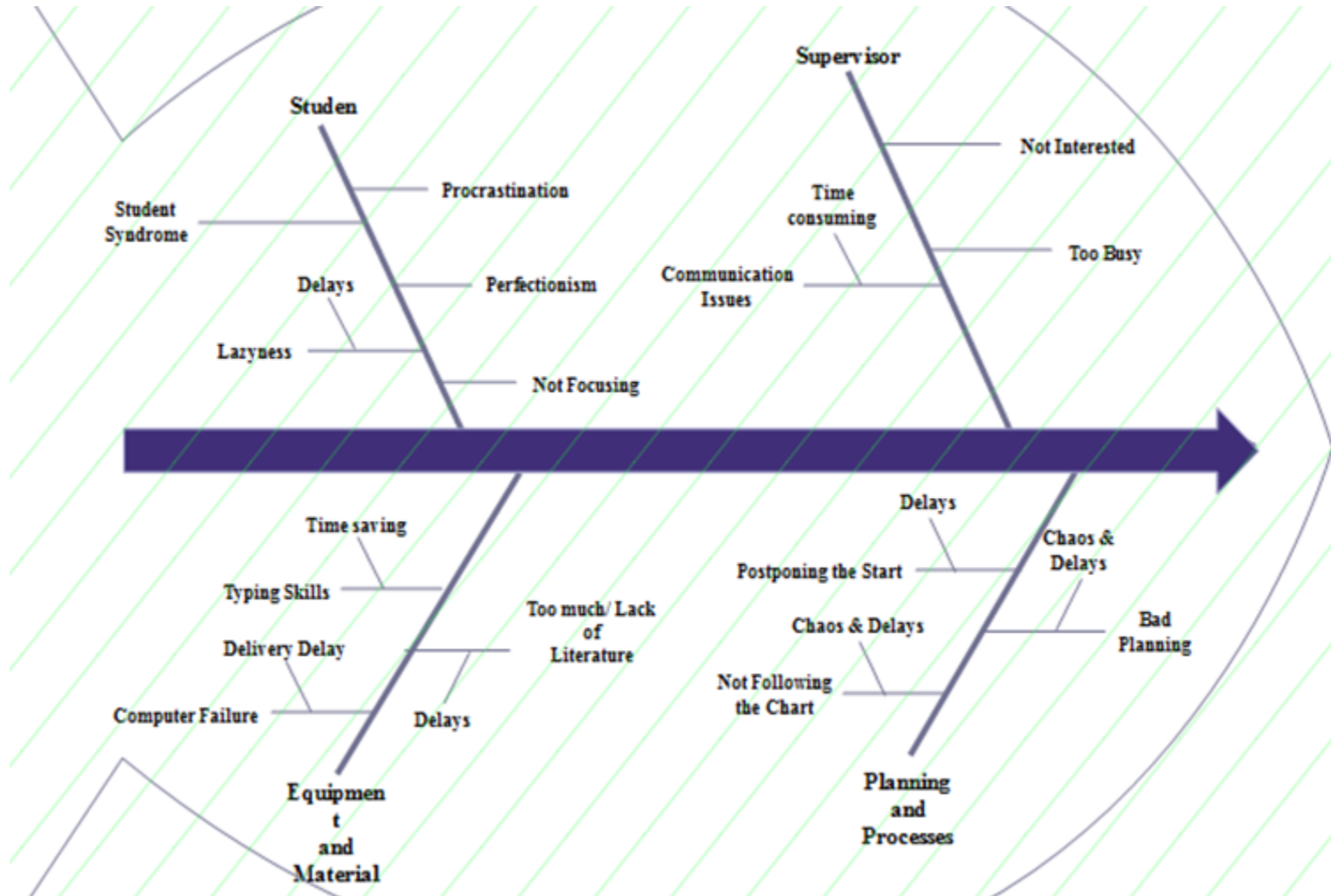
(Methods, **Material**, Manpower, Measurement, Machines)

Another example of Ishikawa I.



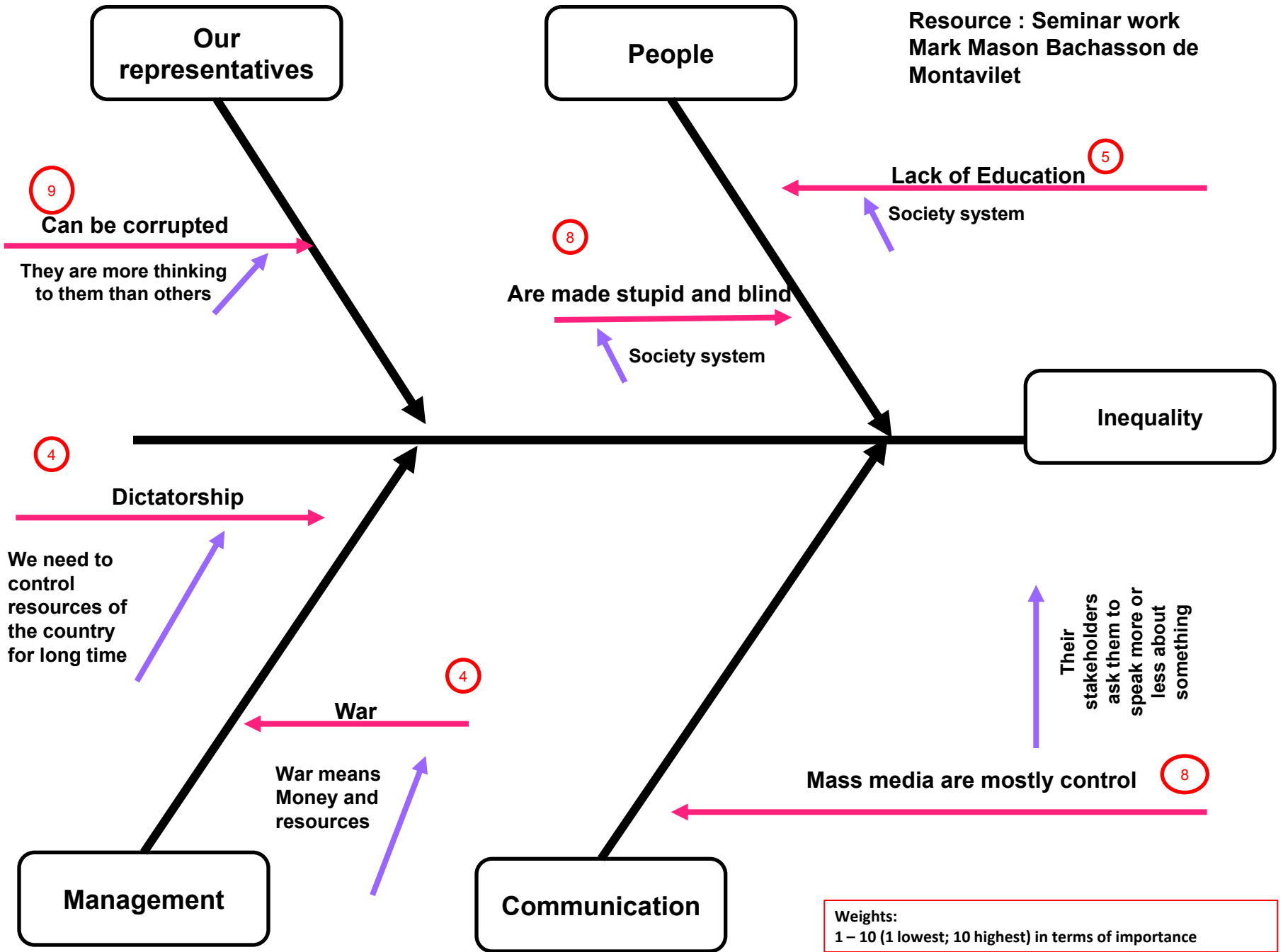
Resource : Seminar work 2015- Ing. Martin Lofaj

Another example of Ishikawa II.



Resource : Seminar work - Tugulea Lilia

Resource : Seminar work
Mark Mason Bachasson de
Montavilet



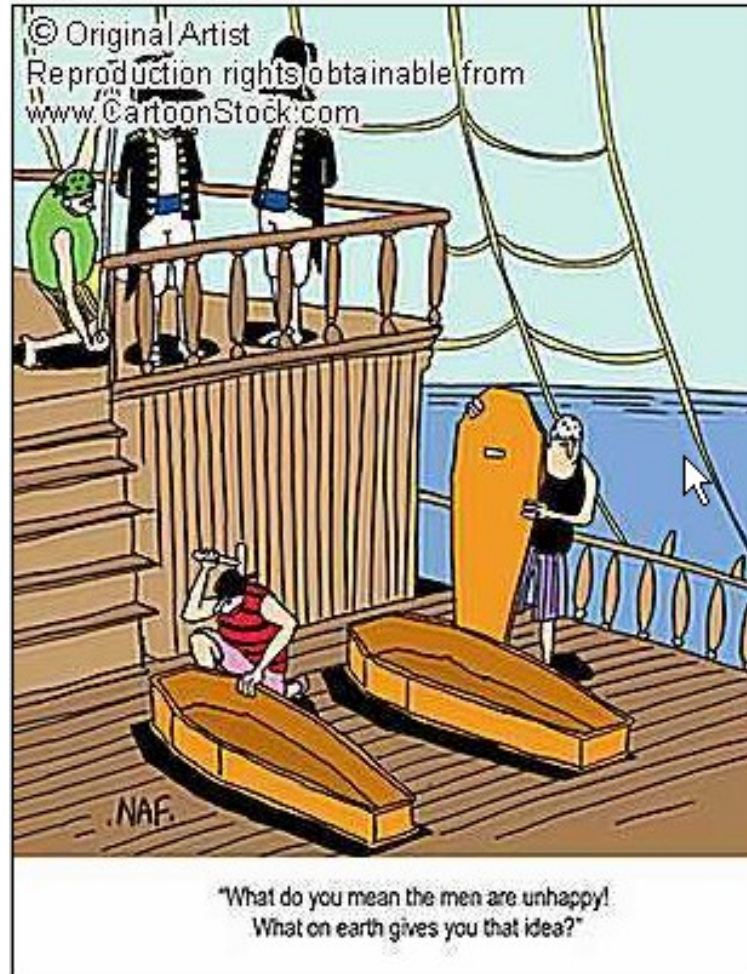
Weights:
1 – 10 (1 lowest; 10 highest) in terms of importance

Dissatisfied employee I



"EVERYTHING OKAY, PHILLIPS?"

Dissatisfied employee II



5WHYs

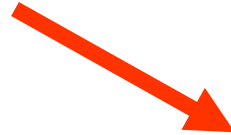
- WHY 1 :Why my car had stopped ?
- No petrol in tank
- WHY 2 :Why i did not have a petrol in my tank ?
- I did not buy in the morning on my way to work
- WHY 3 :Why i did not buy a petrol ?
- No money in my pockets
- WHY 4 : Why no money i my pockets?
- Evening poker
- WHY 5 : Why i did not win a poker game?
- I do not know how to bluff!



5WHYs



Cause



Effect



TQM and Ishikawa FBD and Pareto 80|20

Statistika zmetkovosti **Reject statistics**

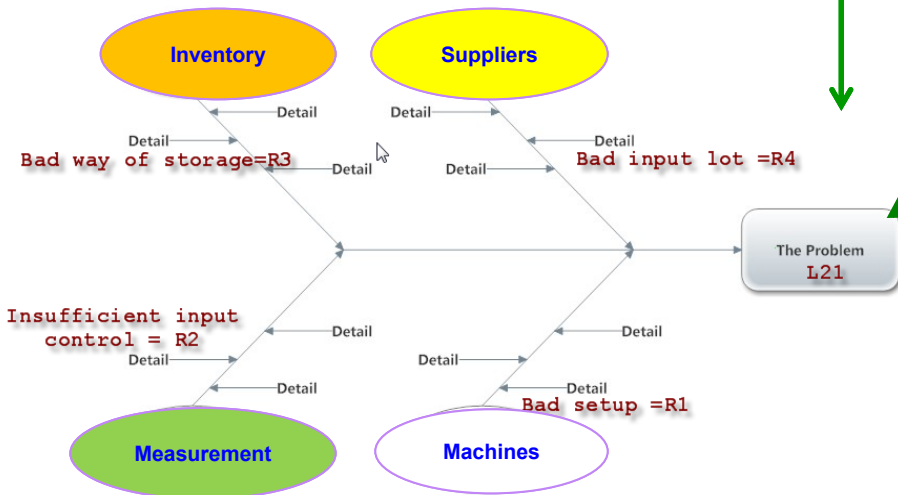
Zmetky celkem **9 485 283** Filtr Data **Filter date**

Rejects Total Filtr čísla zboží. **Filter Item**

Kód	Popis	Množství zmetků	Poměr zmetkovosti
L14	Seké	116 579	1%
L15	Propadliny-polotovary	94 515	1%
L16	Deformace klipu	48 382	1%
L17	Deformace	61 782	1%
L21	Hrudky	848 556	9%
L23	řeky	195 791	2%
L24	Flek - kráter	4	0%
L30	kropenatě	21 654	0%

Bad size, rusty, overflow, bad colour,...

- Reject statistics
- Final product /Rejects
- MachineCenters/Rejects
- Rejects in time
- Final products/Rejects in time
- Machine centers/Rejects in time



Reject type (effects);	Reason 1 (cause)	Reason 2 (cause)	Reason 3 (cause)	Reason 4 (cause)
L19	8	9	2	4
L20	0	1	4	6
L21	7	2	3	5

Score

Manual for urgent reject cause elimination



(to establish correct priority of remedy actions)

Every reject type -> one Ishikawa diagram (electronic version)

Pareto tool : What is it ?

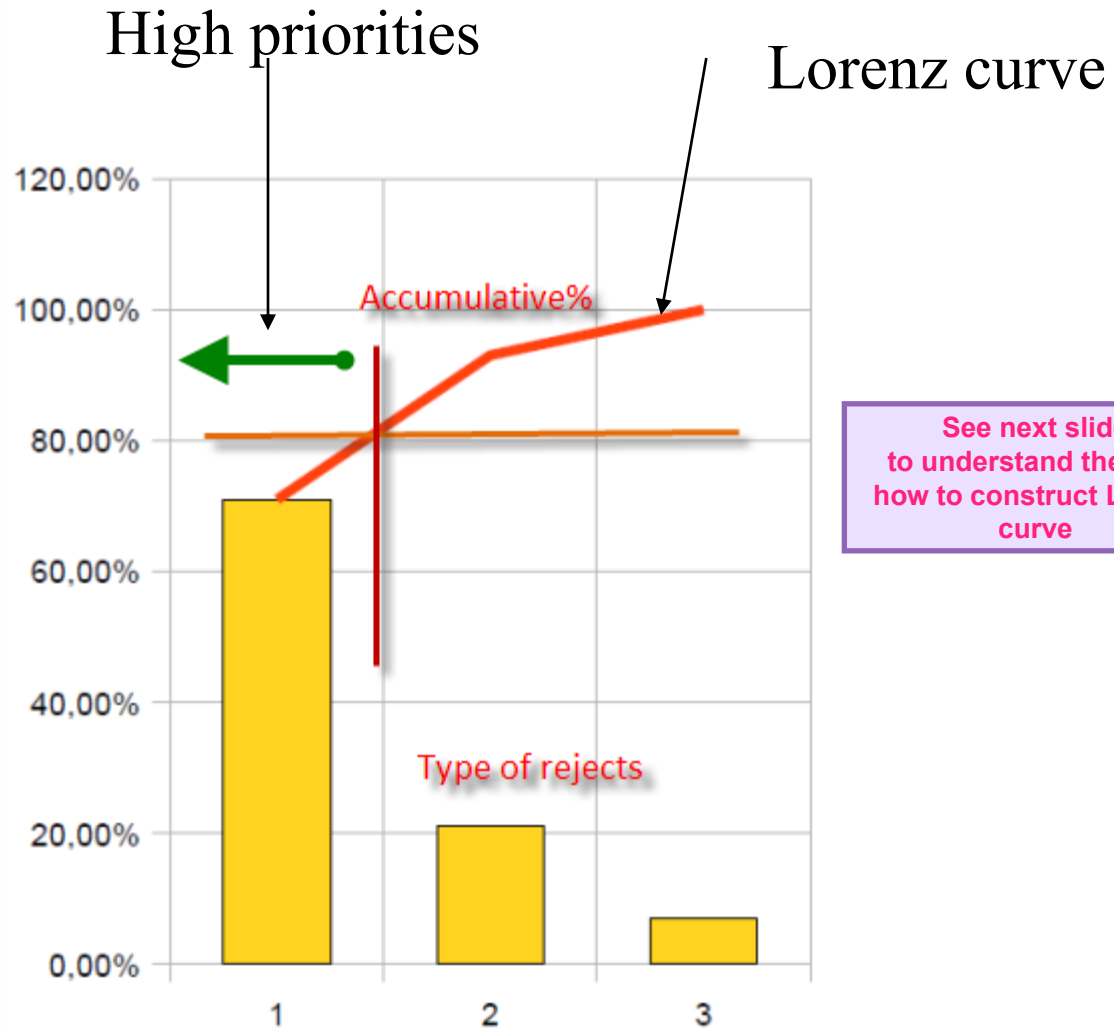
- tool to specify priorities
- which job have to be done earlier than the others
- which rejects must be solved firstly
- which product gives us the biggest revenues
- 80|20 rule



The Pareto Principle



Pareto chart : possibility to split up reject and setup priorities



See next slide
to understand the way
how to construct Lorenz
curve

How to construct Lorenz Curve and Pareto chart

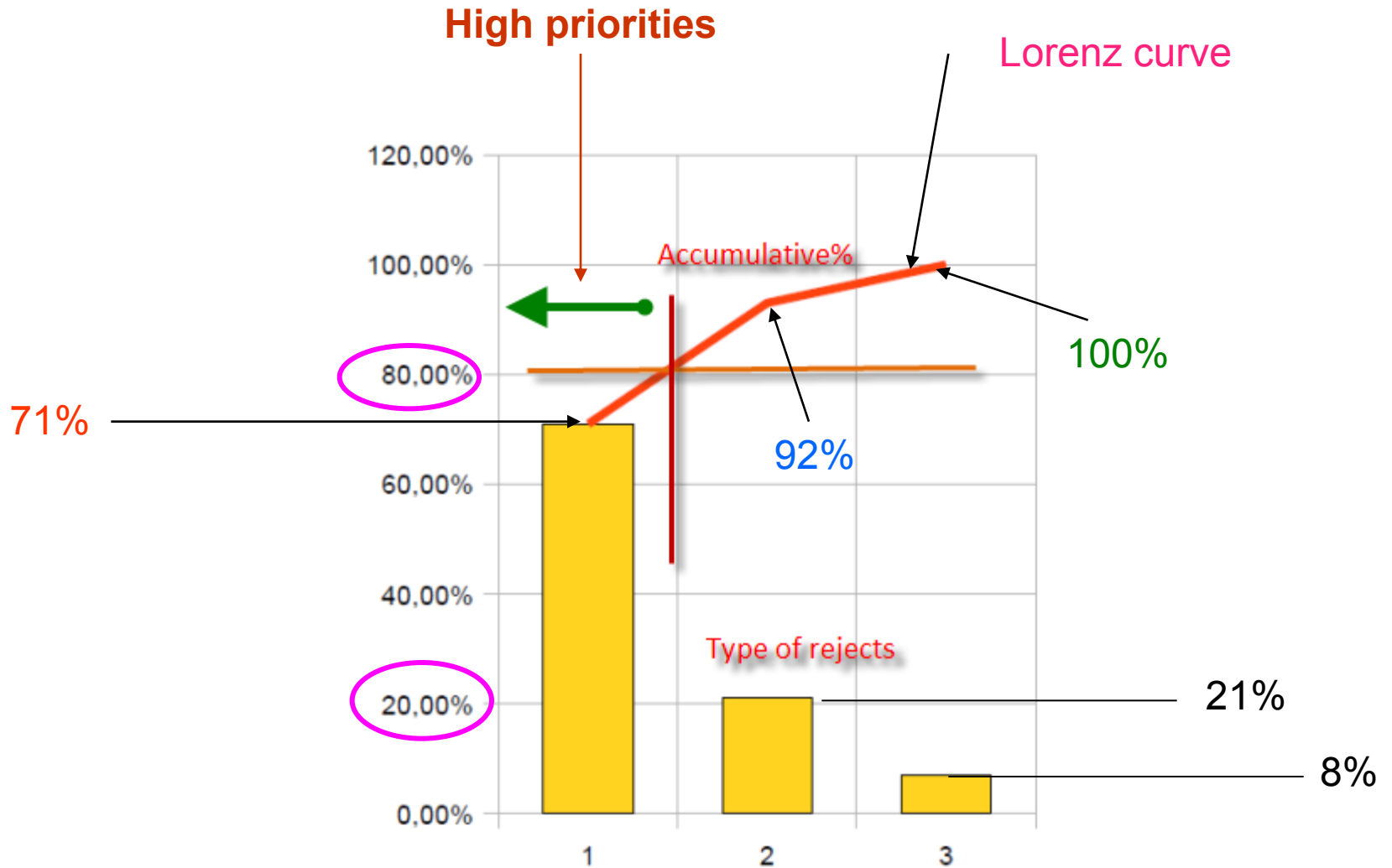
- list of causes (type of rejects) in %
- table where the most frequent cause is always on the left side of the graph

Reject	Type	Importance	Importance (%)	Accumulative (%)
1	Bad size	10	71%	71 %=71%
2	Bad material	3	21 %	92%=71%+21%
3	Rust	1	8%	100 %=92%+8%

Comment 1 : $10+3+1=14$

Comment 2 : $71 \% = 10/14$; $21\%=3/14$

Pareto chart- possibility to split up reject and setup priorities



Pareto analysis per every type of reject – next

step -> practical example of Pareto use in ERP MS Dynamics NAV

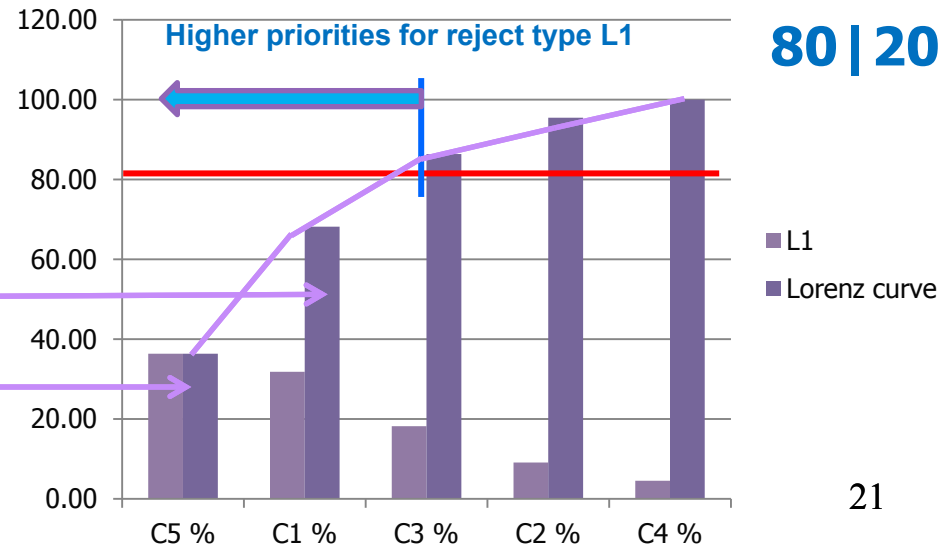
Type of reject	Cause 1	Cause 2	Cause 3	Cause 4	Cause 5	Cause 6	Total
L1	7	2	4	1	8	0	22
L2	2	4	6	8	0	9	29
L3	4	0	0	5	6	7	22
L4	5	7	2	0	1	3	18
L5	0	2	7	3	0	1	13
L6	9	7	5	2	3	6	32
L7	0	7	0	2	3	4	16
L8	1	8	6	2	4	0	21
L9	2	0	5	7	1	4	19
L10	7	2	8	9	7	5	38
C	C5 %	C1 %	C3 %	C2 %	C4 %	C6 %	
L1	36,36	31,82	18,18	9,09	4,55	0,00	100
Lorenz curve	36,36	68,18	86,36	95,45	100,00		

C5	8	36,36	= $(8/22)$
C1	7	31,82	= $(7/22)$
C3	4	18,18	= $(4/22)$
C2	2	9,09	= $(2/22)$
C4	2	4,55	= $(2/22)$

We need to improve (remedy) firstly causes C5 a C1 !!!

36,36 + 31,82

36,36

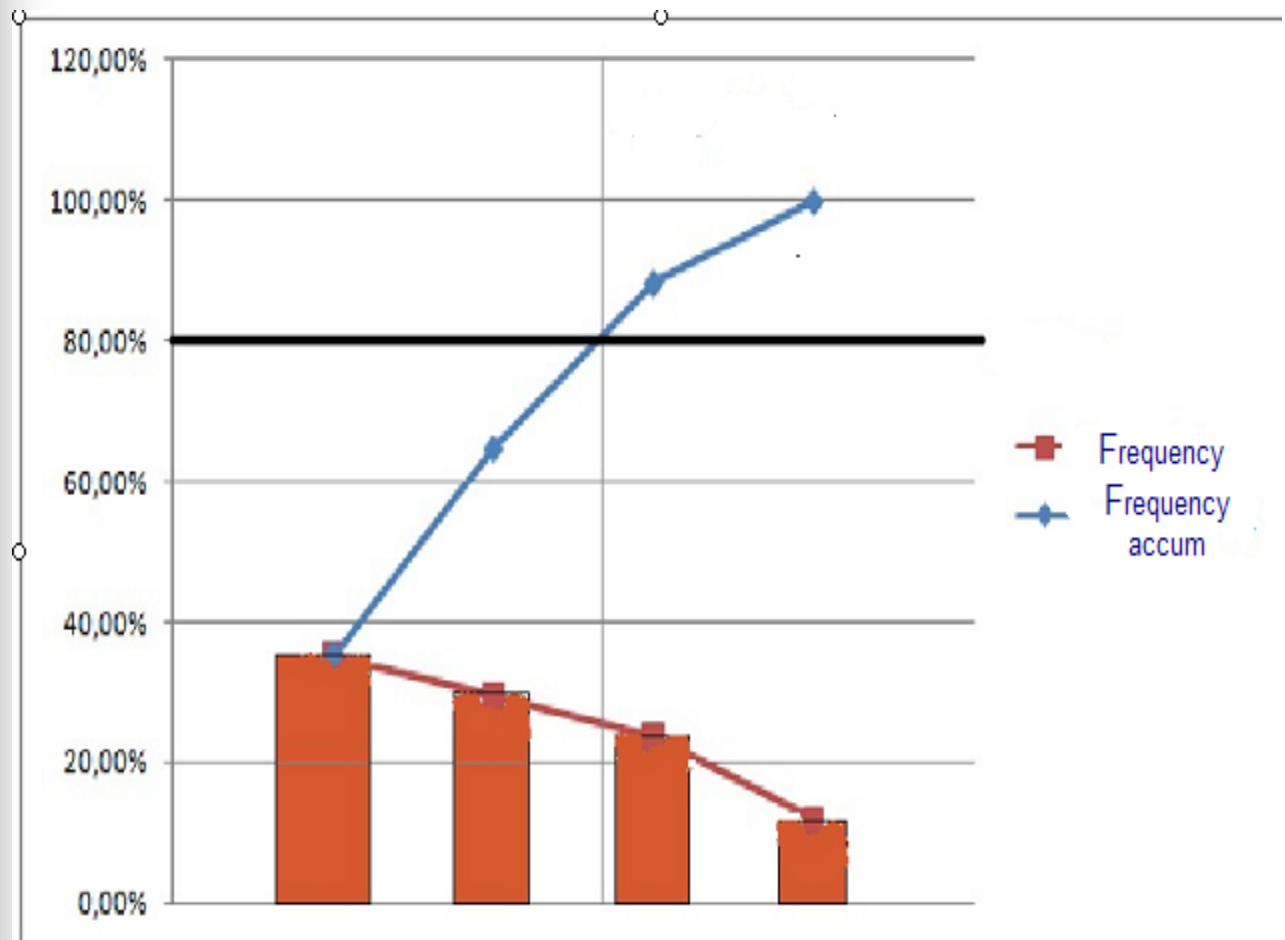


Pareto analysis II - data

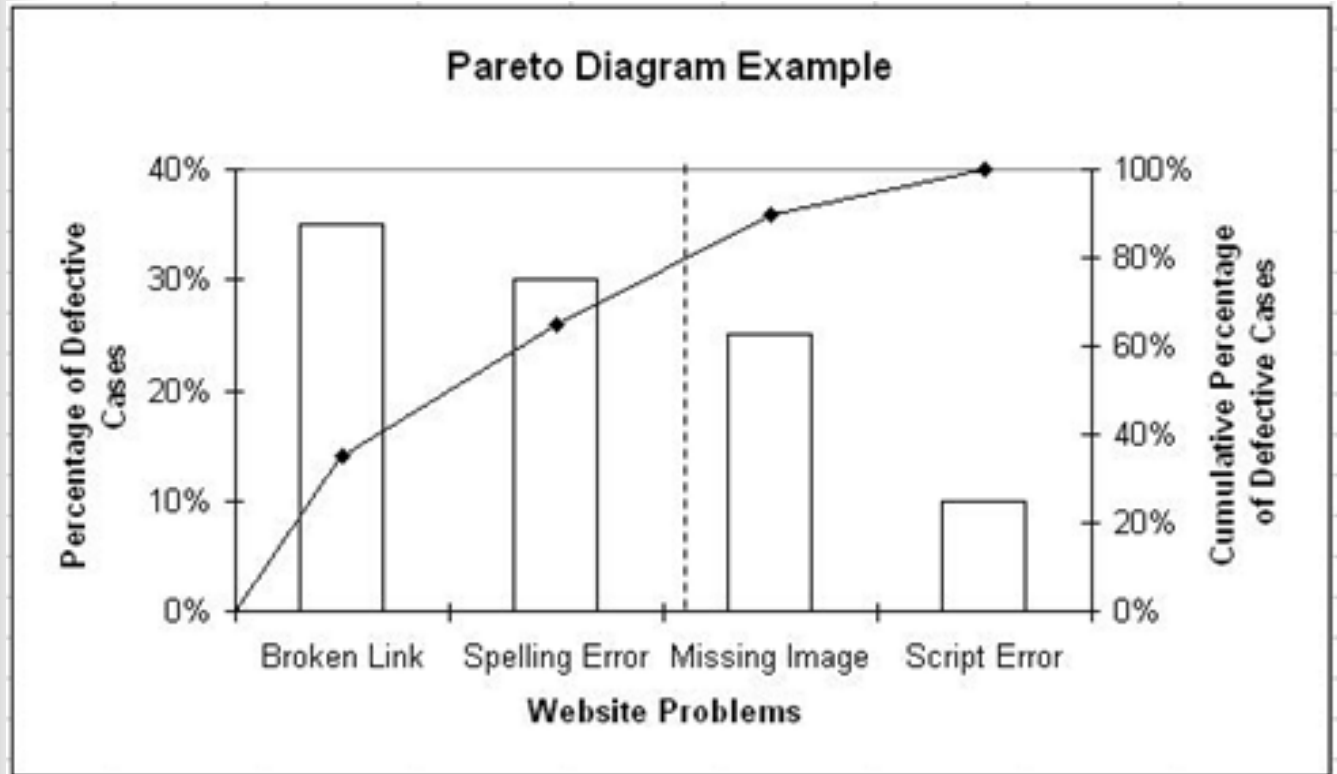
	Frequency	Freq (%)	Freq accum(%)
■ Difficulty	6	(35,29)	(35,29)
■ Resignation	5	(29,41)	(64,71)
■ Underestimation	4	(23,53)	(88,24)
■ Low motivation	2	(11,76)	(100,00)



Pareto analysis II



Pareto analysis II

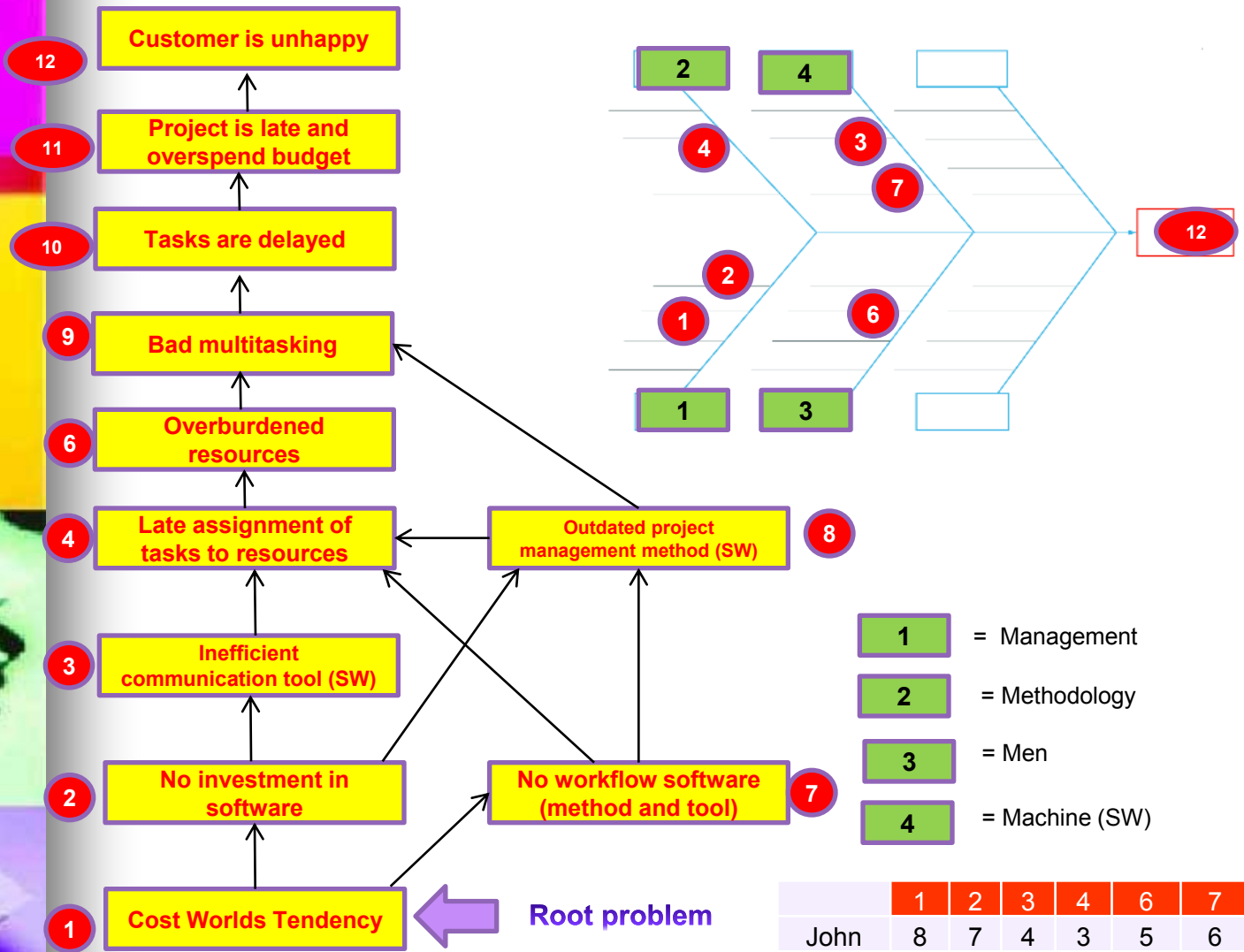


Evaluation of set of rejects

- Every reject is assigned to one Ishikawa tree
- Every tree with empty table is handed over to chosen company of responsible experts
- All tables are collected and evaluated
- See example with two rejects and two experts

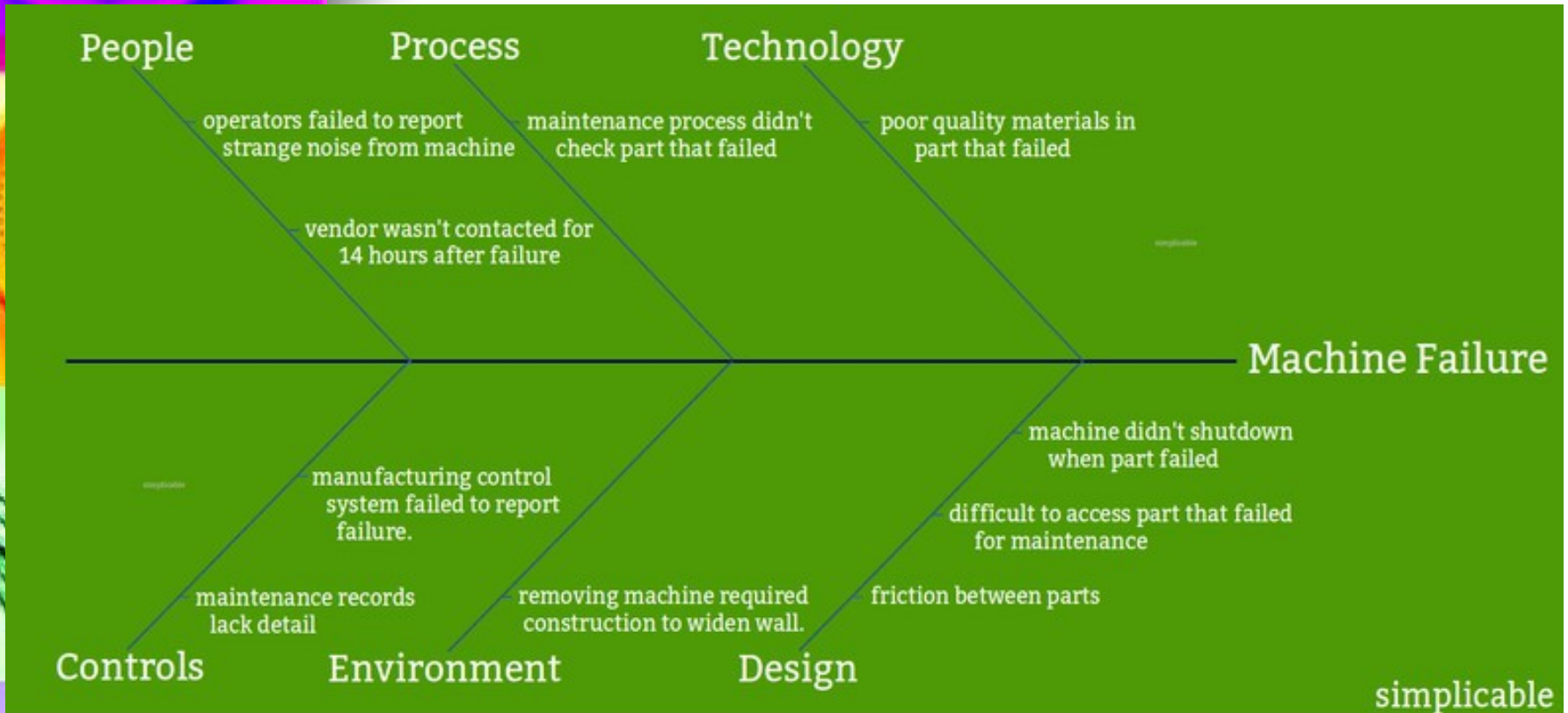
	Domain	Machines	Input control	Setup	Routing	Method	Breakdowns	Workers	Measurment
	Reject code								
	L1	3,5	9	6,5	2	2,5	6	3	1,5
	L2	9,5	2,5	2	5,5	6	8	3,5	2,5
Expert	Reject								
John	L1	3	8	9	3	2	7	2	1
Linda	L1	4	10	4	1	3	5	4	2
Expert	Reject								
John	L2	9	3	3	5	7	8	4	3
Linda	L2	10	2	1	6	5	8	3	2

Current Reality Tree and Ishikava (Pareto)



SW=software

Example 1



Conclusion

Type	Problem Analysis
Definition	A visualization of the causes of a problem.
Also Known As	Ishikawa Diagram
Invented By	Kaoru Ishikawa
Related Concepts	Problem Analysis » Root Cause » Human Error » Internal Controls » Production Line » Root Cause Analysis »





Vilfredo Pareto in person...



Akira Ishikawa in person...